

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: Leavenworthia crassa Rollins

COMMON NAME: glade-cress

LEAD REGION: 4

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION

☐ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date:

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov/>).

☐ Listing priority change

Former LP: ☐

New LP: ____

Date when the species first became a Candidate (as currently defined): October 1, 1999

____ Candidate removal: Former LP: ____

____ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

____ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

____ F – Range is no longer a U.S. territory.

____ I – Insufficient information exists on biological vulnerability and threats to support listing.

____ M – Taxon mistakenly included in past notice of review.

____ N – Taxon does not meet the Act's definition of "species."

____ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering Plants- Brassicaceae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Alabama

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Alabama- Morgan, Lawrence counties

LAND OWNERSHIP

One population occurs on U.S. Forest Service land (Bankhead National Forest). The remaining sites are located on private land with plants at some populations extending onto county-maintained roadside rights-of-way.

LEAD REGION CONTACT: Rick Gooch, 404/679-7124, richard_gooch@fws.gov

LEAD FIELD OFFICE CONTACT: Jackson, Mississippi Field Office, Cary Norquist, 601/321-1128, cary_norquist@fws.gov

BIOLOGICAL INFORMATION

Species Description/Taxonomy

Leavenworthia crassa is a glabrous winter annual from 1 to 3 decimeters (4 to 12 inches (in.)) tall. The leaves are mostly basal, forming a rosette and entire to very deeply lobed or parted. Flowers are on elongating stems and approximately 8 to 15 millimeters (mm) (0.3 to 0.6 in.) long. The petals are either yellow with orange or white with yellow, usually with both color forms intermixed in a single population. The fruit is globe-shaped or slightly more elongate and about 12 mm (0.5 in.) long with a slender beak at the tip.

Leavenworthia crassa can be distinguished from Leavenworthia alabamica, another gladeceess species which occurs in the area, by its globular to oblong fruit with smooth exterior, in contrast to the much more elongated linear fruit, with corrugated surfaces, of the latter species.

Leavenworthia alabamica also does not have the yellow and orange flower forms usually found mixed in population of L. crassa (McDaniel and Lyons 1987).

Leavenworthia crassa, was described by Rollins in 1963 from material collected in 1959 from Morgan County, Alabama. Rollins (1963) delineated the species into two varieties (var. crassa and var. elongata) based on differences in fruit length. However, herbarium and field studies have shown var. elongata to have variation in fruit length within the range of fruit lengths for var. crassa (McDaniel and Lyons 1987). Thus, the species is treated as one taxon throughout this document.

Habitat

This species is a component of glade flora and occurs in association with limestone outcroppings. The terms “glade” and “cedar glade” refer to shallow-soiled, open areas that are dominated by herbaceous plants and characterized by exposed sheets of limestone or gravel. Eastern redcedar (Juniperus virginiana) trees are frequent in the deeper soils along the edges of the glades (Hilton 1997, Baskin et al. 1986, Baskin and Baskin 1985). Historically, glades in northern Alabama occurred as glade complexes where open areas of exposed or nearly exposed limestone were separated by segments of woody vegetation to form an intricate pattern of habitats grading into one another (Hilton 1997). Few undisturbed examples of this community type remain (Hilton 1997, McDaniel and Lyons 1987, Baskin and Baskin 1985, Rollins 1963). Populations of Leavenworthia crassa are now located in glade-like areas exhibiting various degrees of disturbance including pastures, roadside rights-of-way, and cultivated or plowed fields (Hilton 1997). As with most of the cedar glade endemics, Leavenworthia crassa exhibits weedy tendencies, and it is not uncommon to find the species growing in altered habitats; however, its geographical range is probably very similar to what it was in pre-settlement times since none of the cedar glade endemics appear to spread far from their original glade habitat (Baskin et al. 1986).

Life History

Leavenworthia crassa is a winter annual. The seeds germinate anytime from September to October. The plants overwinter as rosettes and flower in March and April. The first seeds mature in late April and during most years, the plants have died and dropped all of their seeds by the end of May. It is unlikely that all seeds produced in spring germinate the next fall, but the length of dormancy in the soil is not known (McDaniel and Lyons 1987).

Historical and Current Range

Leavenworthia crassa is endemic to a 13-mile radius area in north central Alabama in Lawrence and Morgan counties (Rollins 1963). A 1961 record from Lauderdale County has never been

confirmed (McDaniel and Lyons 1987). Surveys by Lyons (in litt. 1981 to R. Sutter), McDaniel and Lyons (1987), and Hilton (1997) were unsuccessful at locating a number of historical sites for Leavenworthia crassa. McDaniel and Lyons (1987) failed to locate eight sites previously reported by Rollins (1963) and Lloyd (1965), and Hilton (1997) was unsuccessful at relocating seven sites listed in McDaniel and Lyons (1987). Currently, only six populations of this species are thought to survive with three populations each in Morgan and Lawrence counties, Alabama.

Population Estimates/Status

Only one of the six populations is rated a high quality site (A-rank), having 500 or more plants in a relatively undisturbed glade. Of the remaining populations, two are given a B-rank (50 or more plants on a glade with some disturbance); two have a C-rank (20 or more plants in disturbed glade community); and one was given a D-rank (few plants in unrestorable habitat) (Hilton 1997). The Nature Conservancy ranks sites and populations using A through D, but criteria may vary depending upon the species and habitat type. Hilton developed these ranks specific to Leavenworthia crassa and its habitat type.

THREATS

- A. The present or threatened destruction, modification, or curtailment of its habitat or range.
This species is endemic to cedar glade areas in north central Alabama that have been significantly altered from their original condition. More than a 50 percent loss in glade habitat has occurred since European settlement (Hilton 1997). Glade habitats today have been reduced to remnants fragmented by agriculture and development.

Hilton (1997) conducted a thorough survey of cedar glade communities in north Alabama using historical records, soil maps, topographic maps, geology and aerial photography. Her efforts resulted in the identification of 22 high priority glades. However, field surveys found only five of these to be in good condition and restorable, and only two of these were considered high quality sites (Hilton, pers. comm. 1999).

At four of the Leavenworthia crassa populations, plants occur in pasture areas, on roadside rights-of-way, and/or in planted fields surrounded by agriculture or residential developments (Hilton 1997). Periodic disturbance, such as plowing in row crop farming, arrests succession and maintains populations in this type of habitat; however, plowing or herbicide treatment in the spring prior to seed set and dispersal could be detrimental to populations. Plants extend into pastures at two sites. Populations are enhanced by the disturbance created from light grazing; however, pastures that are heavily grazed create unfavorable conditions (i.e. soil compaction, soil eutrophication) for Leavenworthia crassa. Improvement of pastures with fertilizer treatments and/or the introduction of forage grasses would eventually decimate populations due to competition. Lyons (in litt. 1981) considered that her failure to relocate many of the historical Leavenworthia crassa sites from the 1960's was due to the change in agricultural practices from growing corn to

using those sites for cattle pastures. McDaniel and Lyons (1987) considered the trend toward converting agricultural sites for use as pasture as a primary threat to the species.

Populations extend onto roadsides or are near roads at five of the six sites. Mowing and herbicide application prior to seed set pose threats to those populations located on roadside rights-of-way. Three historical sites near roads have not been relocated and a portion of one of the existing populations was destroyed by road widening and grading in the 1980's (McDaniel and Lyons 1987). The largest population of this species has a dirt road traversing through a portion of the site, and this has made the site vulnerable to off-road vehicles and dumping (Hilton 1997). Other sites have also been negatively affected by trash dumping and off-road vehicles including the site on Forest Service land. The U.S. Forest Service recently blocked ATV access to the site posted the area closed. Thus far, it appears to have been effective at reducing damage to the glade (A. Cochran, U.S. Forest Service, in litt. 2005).

Hilton (pers. comm. 1999) considers residential and industrial development to be the primary threat to cedar glade communities today and the primary reason for the loss of cedar glade habitat in the last decade. One of the six populations is located in the front yard of a residence. However, at this time, we know of no projects planned in the area that would lead to the destruction of habitat where this species is currently located.

- B. Overutilization for commercial, recreational, scientific, or educational purposes. Overutilization is not considered a threat to this species.
- C. Disease or predation. One population was lost due to infection by a mustard rust in the early 1980's (Lyons and Antonovics 1991, McDaniel and Lyons 1987). It is not known if this disease poses a significant long-term threat to the species.
- D. The inadequacy of existing regulatory mechanisms. This species is considered endangered in Alabama by the Alabama Natural Heritage Program; however, there are no State or Federal laws that give this species any legal protection. The population within the Bankhead National Forest (BNF) is within a Native American cultural site and, as such, is taken out of active timber management. Furthermore, BNF considers cedar glade areas on the BNF, which are habitat for this species, to be a priority community type. These priority communities are protected from detrimental effects caused by management actions. Surveys are conducted for such rare communities in proposed project areas which have potential to adversely affect them (A. Cochran, U.S. Forest Service, in litt. 2005; Gaines, Bankhead National Forest, pers. comm. 2004).
- E. Other natural or manmade factors affecting its continued existence. Winter annuals, such as Leavenworthia crassa, are excluded from many habitats because they are poor competitors (Baskin and Baskin 1985). The most vigorous populations of Leavenworthia crassa are located in areas which receive full, or near full, sunlight at the canopy level

and have limited herbaceous competition (Hilton 1997). Rollins (1963) documented the loss of Leavenworthia crassa individuals caused by invading grasses in an unweeded portion of an experimental plot, while Leavenworthia crassa individuals in the hand-weeded part of the plot thrived. Lloyd (1965) also noted that Leavenworthia species competed poorly with invading weedy species in fallow agricultural fields in north Alabama. Hilton (1997) was unable to relocate five populations in abandoned fields and pastures, which McDaniel and Lyons (1987) had noted as appearing depressed due to competition from invading weedy species. Shading and competition are potential threats at the two largest populations of Leavenworthia crassa (Hilton 1997). One site, reported to be widely open in 1963, is now partially shaded due to a partial closing of the canopy (Hilton 1997).

Non-native plants are a major problem in many glades due to the ever present disturbances that allow for their colonization (Hilton 1997). Non-native plant species pose a threat to one population of Leavenworthia crassa where they have established near an unimproved road traversing the site (Hilton 1997).

Under natural conditions, cedar glades are maintained edaphically through drought and erosion. The shallow soil, exposed rock, and frequent hot, dry summers create xeric conditions that keep competition and/or shading effects of encroaching vegetation in check (Hilton 1997, McDaniel and Lyons 1987, Baskin *et al.* 1986, Rollins 1963). The soils that develop on glades are easily eroded, moving downslope or into fractures in the substrate. Periodic fires also likely played a role in maintaining these communities (Hilton 1997). Due to the continuing loss and modification of cedar glade habitats, presently available habitat for Leavenworthia crassa is primarily in areas modified by human activity where less than optimum conditions exist to perpetuate appropriate habitat. Periodic disturbance is needed to arrest succession and perpetuate suitable habitat.

As with all annuals, this species' long-term survival is dependent upon its ability to reproduce and reseed an area every year. Thus, populations decline and move toward extinction if conditions remain unsuitable for reproduction for many years.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED:

The population and its habitat on Bankhead National Forest (Forest) is protected due to its occurrence in a Native American cultural site and the fact that cedar glade communities are considered "rare communities" on the Forest and protected from any detrimental effects from management actions (A. Cochran, U.S. Forest Service, *in litt.* 2005).

The Service funded a survey of cedar glade habitats in the Moulton Valley physiographic region of northwestern Alabama, the major area for this habitat type in late 1990's. A survey and status update for all populations of this species is planned for spring of 2006. Information from these surveys will also contain information on conservation measures needed to protect and enhance populations.

SUMMARY OF THREATS: Leavenworthia crassa is vulnerable due to the small number of sites and its limited range. Populations are located in remnant glade habitats due to the loss of much of this community type from agricultural and residential conversion of glade habitat. Populations of this species are now located in pastureland, roadside rights-of-way, and cultivated or plowed fields. These populations are potentially threatened by herbicide use and degradation of habitat by dumping, ATV use, and competition, including invasives.

RECOMMENDED CONSERVATION MEASURES: Update landowner information for all sites; work with individual landowners to protect and manage for populations; develop agreement with AL Department of Transportation to insure protection of populations near roads; work with U.S. Forest Service to develop management plan for population on their property.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5*
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: There are only six populations known for this species and only one of these receives some sort of protection. Populations are vulnerable and potential threats occur throughout the species' range. The loss of any sites would have a significant impact on this species' survival so the magnitude of threat is considered high.

Imminence: Although the species occurs in somewhat disturbed areas, populations appear to be able to adjust to periodic disturbances. The small number of sites makes this species vulnerable and potential impacts to these populations from competition, exotics, and disturbance to glades

by dumping and ATV use will require monitoring . At this time, we know of no projects planned in the area that would lead to the destruction of habitat where this species is currently located.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No

Though there are only six populations known for this species, the threat of extinction is not imminent. Threats to this species are the type that have a slow and gradual effect on the populations. We know of no projects planned in the area that would out-right destroy the habitat. This species responds favorably to periodic disturbance.

DESCRIPTION OF MONITORING: Species experts, land managers, affected Service offices, and the State were given copies of the candidate form and asked to provide additional information on this species, its habitat, and any conservation measure implemented. Al Schotz, botanist with the Alabama Natural Heritage Program was contacted in September, 2005; Wayne Barger, botanist with the Alabama Heritage Program/ State Land's Division of Alabama Department of Conservation and Natural Resources, J. Allison Cochran with the U.S. Forest Service, and FWS, Daphne, AL Field Office were all contacted in October 2005.

A visit to all sites was last made in 2002 by Schotz of the Alabama Natural Heritage Program. The site on Bankhead National Forest is visited regularly by Forest Service staff and was last monitored in 2005. Since there is no funding supporting annual monitoring of this species at all sites, contacting those who may have information on the species is an appropriate means of monitoring. A survey of all sites is planned for spring of 2006 by the Alabama Natural Heritage Program.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Indicate which State(s) did not provide any information or comments: No information was received from Alabama ADCNR.

LITERATURE CITED

- Baskin, J.M. and C.C. Baskin. 1985. Life cycle ecology of annual plant species of cedar glades of southeastern United States, pp. 371-398. In: J. White (ed.). The Population Structure of Vegetation. Dr. W. Junk Publishers, Dordrecht.
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- Kral, R. 1983. Leavenworthia crassa. A report on some rare, threatened, or endangered forest-related vascular plants of the South. Vol. 1. 492. U.S. Forest Service Technical Publ. R8-TP2.
- Lloyd, D.G. 1965. Petal color polymorphism in Leavenworthia (Cruciferae). Contr. Gray Herb. 198:9-40.
- Lyons, E.E. and J. Antonovics. 1991. Breeding system evolution in Leavenworthia: Breeding system variation and reproductive success in natural populations of Leavenworthia crassa (Cruciferae). American Journal of Botany 78:270-287,
- McDaniel, S. and E. Lyons. 1987. Status report on Leavenworthia crassa Rollins. Unpublished report to U.S. Fish and Wildlife Service, Jackson, MS. 13 pp.
- Rollins, R.C. 1963. The evolution and systematics of Leavenworthia (Cruciferae). Contr. Gray Herb. 192:1-98.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Cynthia Dohner 5/3/2006
Acting Regional Director, Fish and Wildlife Service Date



Concur: _____ August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do Not Concur: _____
Director, Fish and Wildlife Service Date

Date of annual review: October 2005

Conducted by: Jackson, Mississippi Field Office